Editorial note: This article was originally published in the September 1992 issue of *PW*. As it proved very popular at the time, I've decided it deserves

Valve & Vintage Antennas!

Tony Martin G4XBY has built two experimental collinear antennas for the 430MHz band, using lengths of wire and other basic materials. Although they're simple antennas, Tony says they should work well in any location.

The two antennas I'm going to describe came about from a series of experiments. But, I'm going to describe them individually.

The diagram in **Fig. 1**, shows the first experimental antenna. For this version, which is a 5λ/8 over 5λ/8 collinear antenna, you'll need a piece of hard drawn copper wire 1.5 metres in length.

Take the length of wire and straighten it out. But be warned, this isn't as easy a task as it sounds!

I've found the best method to straighten the wire out, is to start by fixing one end to something that won't move. Then, all you have to do, is ask someone to pull the other end as hard as possible, by leaning back and using their weight against it.

While this kind person is pulling, and the wire is under tension, you can be busily 'wriggling' the kinks and bends out by hand.

Vital Statistics

Now let's look at the vital statistics of the project. It's easy enough, as all the measurements are made from one end. You'll see I've marked this as point A in Fig. 1.

Mark out all the points, B-I, before you start. I find a small triangular file provides one of the best methods of marking this wire, as it is rather hard. Make rings, or nicks (but not too deep) on the wire at the distances shown, taking care to measure everything accurately.

Bending The Wire

You start by bending the wire at a right angle at point B, and trapping it against a length of 12.5mm (0.5 inch) dowelling. I use a self-gripping wrench, sometimes known as a 'mole' wrench, for this job.

Keeping about 7mm between each turn, wind the wire in a clockwise direction around the dowelling as tightly as possible. After four turns, this should bring you to point C, which should be in line with the section A-B.

Now bend the wire, again at a right angle, to continue in the original direction. At point D, repeat the process with the dowel and pliers, to create a similar coil to above.

The next job to do, is to form the 'J' match feed-line. From point E, make a mark at 178mm in the direction of point I. This is to become the centre line (mid way between G and H) of the 'U' bend at the bottom of the 'J' match section.

The Tuning Arrangements

The tuning arrangements are straightforward. Make up a 'patch' lead to fit your s.w.r. meter. Make sure you're using good quality crocodile clips on one end.

Ideally, the 'patch' lead should be an odd number of half wavelengths long at the centre working frequency of 434MHz. The free space is half a wavelength of 434MHz is 346mm. Taking the usual velocity factor of coaxial cable as 0.66, this would give a coaxial half wavelength as 228mm.

To start the tests, suspend the antenna from the ceiling (or somewhere out of the family's way!), using nylon mono-filament fishing line or similar. Don't forget to keep the antenna as far away as possible from anything that might de-tune the system.

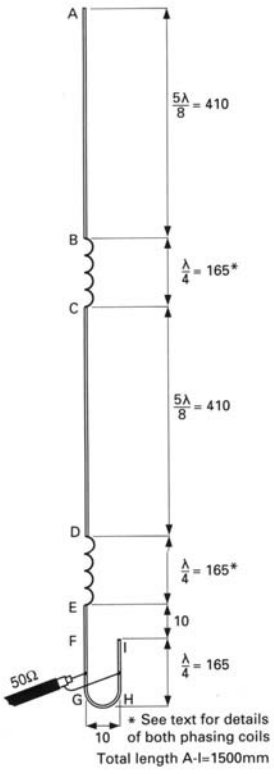

Fig. 1: Detailed constructional diagram of the first antenna project. See text for full details on setting-up and adjusting the matching of the coaxial cable feed to the antenna.

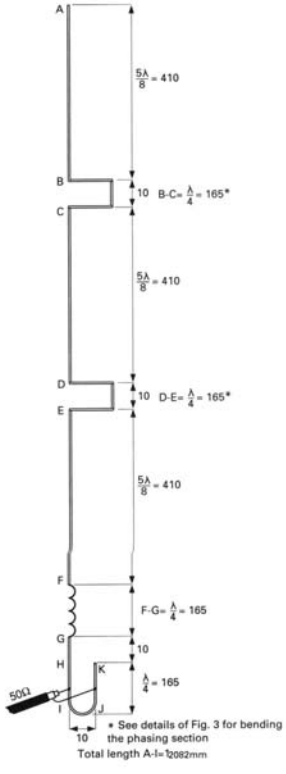

Fig. 2: Constructional details of the second antenna project. See text for setting-up the matching of the antenna to the coaxial cable feed-line.

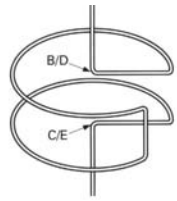

Fig. 3: constructional details of the preferred way of winding the coils for positions D-E and B-C on antenna project two. coils wound using this method are less bulky, and the finished antenna is easier to fit into the plastic tube (see text

Next, you should attach the coaxial outer clip to the short side of the 'J' and the inner on the long side. Once this has been done, you can begin to adjust the feed-point to give the lowest s.w.r. reading possible.

It's not the difficult process, as long as you remember the following rule. And that golden rule is; keep both clips equal distances from their points G or H as you adjust the feed-point.

When you are happy with the s.w.r. measurements you've obtained from the antenna, solder a piece of 50Ω coaxial to the same positions as the clips. Then check the s.w.r. again, to see that it's still low.

If all is well, the antenna may be 'potted' into a piece of plastic water pipe. This in not a difficult job, and it will proved a neat finish, as shown in the diagrams in **Figs. 4** and **5**.

Second Antenna

Having tackled the first project, I'll describe the second antenna. As you've probably surmised, the second version I'm going to describe is based on the first antenna.

Project number two is slightly different as I've added another 5λ/8 section to provide greater gain. This time, I've also altered the phasing arrangements between the upper two sections of the antenna.

Before you start, look at the diagram in Fig. 2, which is the linear diagram of the second project. The new phasing sections, comprising B-C and D-E are phasing lines, rather than phasing coils. I have retained a phasing coil for the lower section, between points F and G.

Using the same methods and techniques as I've already described, mark out the various distances from the reference (point A) as shown in Fig. 2. Once this has been completed, for the time being, just leave the two sections, B-C and d-E as shown in the diagram.

Next, beginning at point F, using the dowelling method (already described), wind the section F-G into a four turn coil. The coil must be wound with about 7mm between the individual turns.

Now you'll have to repeat the bending process. This is done to form the 'J' match section, just as you did for the first antenna.

The next job is the bending of the two phasing lines. These two sections of the antenna are formed as shown in the diagram in **Fig. 3**.

The diagram in Fig. 3 demonstrates the most compact method of bending the wire, and the overall diameter of the phasing section should be about 20mm. the antenna elements run centrally through the phasing sections.

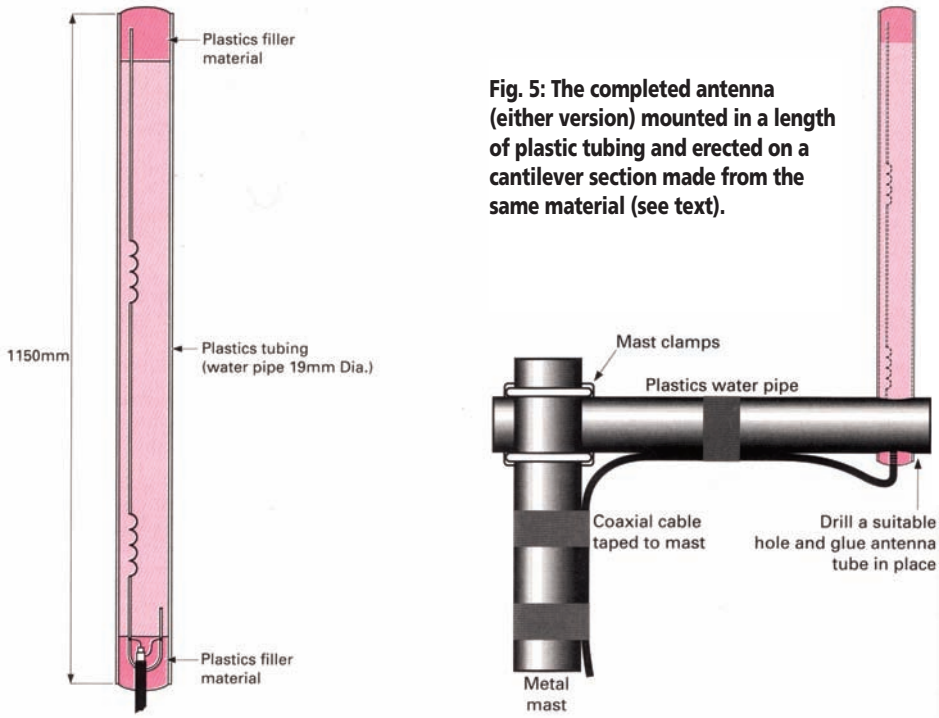

Fig. 5: The completed antenna (either version) mounted in a length of plastic tubing and erected on a cantilever section made from the same material (see text).

Fig. 4; Diagram showing the finished antenna (version one) fitted into a section of plastic water pipe. See text for suggestions regarding suitable materials.

Another method is to wind the whole section around a length of 25mm (one inch) dowelling to form an almost complete loop. However, this method is slightly less compact, and the loop formed is off to one side of the antenna, making the 'potted' project quite large in diameter.

As with the first antenna, you'll have to set up the feed-point to achieve the lowest s.w.r. possible at band centre, 434MHz. Once again, this is done by moving the feed-point on the 'J' match section so as to provide the lowest s.w.r. reading at 434MHz.

Note: There's an important point to remember if the antennas are to be mounted on a metal pole, as shown in **Fig. 5**. When mounted in this way, you must make sure that the cross support plastic tube is in-line with the feed-points on the 'J' match section of the antenna.

No Gain Claims

I make no claims for the gain or radiation pattern. As the results achieved will vary between antennas, I only offer these designs as a basis of experimenting with antennas at u.h.f. frequencies.

Even though I've qualified my results, they've worked for me. In my location, using either antenna, I can gain access to repeaters that a 'Slim Jim' design is unable to do under the same conditions.

These two projects are fun to build, cheap to make and they work. Go on, have a go yourself! **PW**

How much? Around £5
How difficult? Intermediate

Shopping list

Copper wire (see text), coaxial cable, crocodile clips, suitable length of 19 mm plastic water pipe, mast clamps, plastic insulation tape, plastic filler material for sealing antenna into housing tube (filters such as Plastic Padding, available at car accessory shops are suitable for this job, but make sure that the material you use is not loaded with metal and that it's not a conductor).

Warning: Many plastic filler materials give off inflammable vapours that can be dangerous in confined areas. Be safe, and follow the manufacturer's advice on where and how you mix the material.